Operative treatment of mid-shaft clavicle fracture by locking plate

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Abstract

Fracture of the clavicle is one of the most common injuries of human skeleton. It has been traditionally treated non-operatively. The present study was undertaken to evaluate the role of surgical treatment in less than 3 weeks old displaced or comminuted clavicle fractures with healthy peripheral skin condition.

Keywords: Clavicle, Locking Plate.

Introduction

Clavicle fractures is a standout amongst the most widely recognized hard wounds. They represent 3% to 5% of grown-up breaks and 45% of wounds to the shoulder support. The clavicle is a S-formed bone that goes about as a strut between the sternum and the glenohumeral joint. It also has a suspensory function to the shoulder girdle.(1)

A weak spot in the clavicle is present at the midclavicle region, which accounts for most fractures occurring in this region. Midshaft clavicle fracture is a standout amongst the most widely recognized wounds of the skeleton, speaking to 3% to 5% of all breaks and 45% of shoulder wounds. The yearly frequency of midshaft clavicle fracture is 64 for each 100 000 populace. Midshaft cracks frame 70% to 80% of all clavicle breaks; sidelong cracks contribute 15% to 30%, and average breaks, at 3%, are generally uncommon. The peak incidence occurs in the third decade of life.(2)

The frequency of non-union of mid-clavicle fractures is generally cited as being from 0.1 to 0.8% and the pillar of treatment has for some time been non-agent. Later information, in light of itemized characterization of fractures, propose that the frequency of non-union in dislodged comminuted midshaft clavicle fractures in grown-ups is in the vicinity of 10 and 15%.(3)

Midshaft fractures have generally been dealt with non-operatively. Surgical treatment of intense midshaft fractures was not supported due to moderately visit and genuine entanglements. Surgery is acknowledged increasingly as essential treatment for separated midshaft clavicle fractures, basically in light of the fact that the aftereffects of non-agent treatment are translated as second rate compared to agent treatment both clinically and practically.

A few investigations have inspected the wellbeing and adequacy of essential open lessening and inside obsession for totally uprooted midshaft clavicle fractures and have noted high union rate with a low inconvenience rate.(4) In countless clavicle fractures an acceptable result is conceivable with a low entanglement rate utilizing a locked compression plate.(5) Primary internal fixation of displaced comminuted mid-shaft clavicle fractures prompts unsurprising and early come back to work.(6)

The present consensus that great majority of clavicle fractures heal with non operative treatment is no longer valid. The amount of pain and disability during the first three weeks of conservative treatment has been underrated and the common view that non-union does not occur is wrong. Pressure from a displaced fragment on the retro clavicle part of the brachial plexus may cause symptoms after conservative treatment. Recent studies have shown that higher rate of non-union and specific deficits of shoulder function in subgroups of patients with these injuries. Hence they can be treated as a spectrum of injuries requiring careful assessment and individualized treatment. Non-union after a clavicle fracture is an uncommon occurrence, although the prevalence is higher than previously reported. There are subgroups of individuals who appear to be predisposed to the development of this complication either from intrinsic factors such as age or gender, or from the type of injury sustained.

There are different strategies for treating clavicle midshaft fractures, for example, intramedullary K-wires, JESS fixation or plate fixation. Specifically, plate fixation can help acquire firm anatomical reduction in extreme displaced or comminuted fractures. There are different plates including Sherman plates, dynamic compression plates and semitubular plates. Among them, a reproduction plate and remaking locking compression plate (LCP), which is pre-molded to the S-formed arch of the clavicle, are generally favored. We have taken up this examination to pick up a more profound understanding of results and issues related with this strategy, to assess the utilitarian result after fixation of displaced clavicle fractures with locking compression plate.

Materials & Methods

The present investigation was done from July 2014 to September 2016 at Department of Orthopaedics in Dr. D. Y. Patil Medical College Hospital and Research Centre, Pimpri, Pune.

Amid this period 30 patients of clavicle mid shaft fractures were dealt surgically.

Inclusion criteria:

- Patient of both sexes and more than 18 years of age.
- All patients with mid shaft clavicle fracture displaced and/ or grossly comminuted.

Exclusion criteria:

- Age < 18 years.
- Open fractures.
- Fracture in medial or lateral third of clavicle.
- Pathological fractures.
- Undisplaced fractures.
- Associated head injury.
- Associated with neuro-vascular injury.
- Established non union from previous fracture.
- Associated acromio-clavicle joint dislocation.
- Any medical contraindication to surgery or anaesthesia (heart diseases, renal failure or active chemotherapy).
- Lack of consent.

Instruments

- 3.5 mm 7 to 9 hole clavicle locking compression plate (pre-contoured).
- 2.8 mm drill bit with drill sleeve for 3.5 mm locking cortical screws of varying sizes.
- 2.5 mm drill bit for 3.5 mm cortical screws of varying sizes.
- Power Drill.
- Depth gauge.
- Hexagonal screw driver.
- General instruments like retractor, periosteal elevator, reduction clamps and bone lever.

Observations & Results

Table 1: Time till return to functional range of motion wise distribution of cases in study group

Time (weeks)	No of cases	Percentage
4 – 5	17	56.67
6 – 8	13	43.33
Total	30	100

17 cases took 4 to 5 week time for functional range of motion and 13 cases took 6 to 8 weeks time for full functional range of motion.

Table 2: Time of union wise distribution of cases in study group

Time of union (weeks)	No of cases	Percentage
≥14	4	13.33
<14	26	86.67
Total	30	100

4 cases had ≥14 weeks time for union and 26 cases had less than 14 weeks for union.

Table 3: Complication wise distribution of cases in study group

Complication	No of cases	Percentage (n=30)
Plate loosening	1	3.33
Plate prominence	2	6.67
Delayed union	4	13.33
Malunion	2	6.67
Restriction of shoulder movement	2	6.67
Skin scar	3	10

Delayed union was seen among 4 cases, 3 cases had skin scar, 2 cases had plate prominence, malunion and restriction of shoulder movement respectively. One case had plate loosening. There were no post-operative infections.

Table 4: Outcome wise distribution of cases in study group

Outcome	No of cases	Percentage
Excellent	23	76.67
Good	5	16.67
Fair	2	6.66
Total	30	100

23 cases had excellent outcome, 5 cases had good outcome and 2 cases had fair outcome.

Table 5: Association between time till return to functional range of motion and outcome in study group

Time (weeks)	Outcome			Total
	Excellent	Good	Fail	
4 – 5	14	3	0	17
6 – 8	9	2	2	13
Total	23	5	2	30

Among 17 cases with 4 to 5weeks time for functional range, 14 cases had excellent outcome, among 13 cases with 6 to 8 week time to return functional motion, 9 cases had excellent outcome.

Table 6: Association between time of union and outcome in study group

Time of union (weeks)	Outcome			Total
	Excellent	Good	Fail	
≥14	2	1	1	4
<14	21	4	1	26
Total	23	5	2	30

Among 26 cases with time of union less than 4 weeks 21 cases had excellent outcome 1 had fair, among 4 cases with time of union more than 14 weeks, 2 had excellent 1 had fair outcome.

Discussion

The present study was carried out to study the surgical management and to assess its functional outcome in fresh displaced midshaft clavicle fracture and the duration of union and return to functional range of motion. Complications associated with middle one third clavicle fractures and their management was also studied.

17 cases had time to return to functional range of motion after surgery for clavicle fracture within 4 to 5 weeks and 13 cases had 6 to 8 weeks time for full range of motion (Table 1).

Time for reunion of clavicle after surgery was less than 14 weeks among 26 cases had 4 cases had ≥14 weeks time for reunion of clavicle after surgery (Table 2). Similar finding was seen in a study conducted by Chandra Prakash Pal, Rajendra Kumar Shakunt, Deepak Kumar, Amrit Goyal, Aditya Prakash Tyagi, Trilok Chand Pippal (2015) thought about union rates and functional outcomes for displaced mid-shaft clavicle fractures that were treated with either primary open reduction and plate fixation. 32 patients in the vicinity of 18 and 60 years old who had an acute displaced mid-shaft clavicle fracture were enlisted and experienced primary open reduction and plate fixation and non operative treatment. Results showed 11 cases had time of union within 12 to 24 weeks among open reduction plate fixation.[7]

Sahal A. Altamimi, Michael D. McKee (2008) looked at persistent oriented result and complication rates following nonoperative treatment and those after plate fixation of displaced midshaft clavicle fractures. 132 patients with a displaced midshaft fractures of the clavicle were randomized to either operative treatment with plate fixation or nonoperative treatment and results demonstrated that mean time to radiographic union 16.4 weeks in the operative group.[8]

Delayed union was common complication among 4 cases, 3 cases had skin scar, 2 cases had plate prominence, malunion and restriction of shoulder movement respectively after surgery for clavicle fracture (Table 3). Similar finding was seen in a study Olivier v Erborgt et al (2005) reported the surgical outcome after open reduction and plate fixation of middle-third fractures of the clavicle in 39 semi-professional athletes. Wound infection was seen among 18% of the cases, 5% of the cases had nonunion, 7% of the cases had neurological symptoms and 5% of the cases had refracture.[9]

Der Tavitian J, Davison JN, Dias JJ. (2002) studied preopertive disabilities and the postoperative outcome and complication among Clavicle fracture. Eleven fractures were midshaft, eight were lateral third and one medial third included in the study. Complications noted were clavicle non-union with 18 (6%) cases, 45 (15%) reported complications related to soft tissues, seven (2%) complications related to the scar and 24 (8%) failures of union.[10]

Excellent outcome was seen among 23 cases, 5 case shad good outcome and 2 cases had fair outcome after surgery for midshaft clavicle fracture (Table 4). Similar finding was seen in a study conducted by Deepak Kumar, Chandra Prakash Pal, Rajendra Kumar Shakunt, Aditya Prakash Tyagi, Trilok Chand Pippal, Chandra Prakash Pal, Amrit Goyal, (2015) analyzed union rates and functional outcomes for displaced mid-shaft clavicle fractures that were treated with either primary open reduction and plate fixation. 32 patients in the vicinity of 18 and 60 years old who had an acute displaced mid-shaft clavicle crack were enlisted and experienced primary open reduction and plate fixation and non operative treatment. Among 12 cases 10 cases had excellent outcome, 1 had good outcome, 1 had fair outcome.[7]

Time to return to functional range was not significantly associated with outcome among the study group. Among 17 cases with 4 to 5 weeks time to return to functional range 14 cases had excellent outcome and among 13 cases with 6 to 8 weeks time to functional range 9 cases had excellent outcome (Table 5).

Time of union of clavicle fracture after surgery was not significantly related to outcome in the study group. Among 26 cases with less than 14 week time for union 21 had excellent outcome and among 4 cases with more than 14 week time for union 2 had excellent outcome (Table 6).

Conclusion

- Functional range of motion after surgery for mid shaft clavicle fracture was seen after 4 to 5 weeks.
- Time for union after midshaft clavicle fracture surgery was less than 14 weeks.
- Delayed union was common complication along with skin scar, plate prominence and malunion.
- Time interval between trauma and surgery was best predictor for outcome mid shaft clavicle fracture.

Summary

The surgical administration and its functional result in fresh displaced midshaft clavicle fracture and the term of union and come back to functional scope of movement was considered. Complications related with middle one third clavicle fractures and their administration was likewise examined.

- Functional range of motion was seen after 4 to 5 weeks among 17 cases and 13 cases had after 6 to 8 weeks.
- Time for union after midshaft clavicle fracture surgery was less than 14 weeks among 26 cases and only 4 cases had time for union more than 14 weeks.
- Delayed union (13%) was seen as most common complication followed by malunion, plate prominence. Skin scar was seen among 10% of the cases.
- Excellent outcome after surgery was seen among 23 cases, good outcome was seen among 5 cases and 2 cases had fair outcome.
- Time interval was significantly associated with level of outcome in the study. Lesser the time interval between trauma and surgery better was the outcome.
- Time to return to functional range of motion was not significantly associated with outcome among the cases with mid shaft clavicle fracture.
- Time of union after surgery for midshaft clavicle fracture was not significantly associated with level of outcome in the study group.

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